

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of

Katsuji HATTORI et al.

Prior Group Art Unit: 2871

Serial No.: Rule 1.53(b) Cont. of
S.N. 09/806,230
filed: March 28, 2001

Filed: December 6, 2001

For: LIQUID CRYSTAL DISPLAY AND METHOD OF MANUFACTURE

PRELIMINARY AMENDMENT

Commissioner for Patents
Washington, D.C. 20231

Sir:

Prior to examination of the above-identified application,
please undertake the following changes:

IN THE CLAIMS:

Amend claims 1 to 3 as follows:

1. (Amended) A liquid crystal display which comprises a pair of substrates and a liquid crystal layer sandwiched between the pair of substrates;

wherein where the alignment state of a liquid crystal when no voltage is applied to the liquid crystal layer is defined as an alignment state 1 and the alignment state of the liquid crystal used for performing displaying is defined as an alignment state 2, the alignment state 1 differs from the alignment state 2;

wherein source wiring electrodes, gate wiring electrodes, and switching elements are disposed on one of the substrates;

wherein a flattening film is stacked on the switching elements;

wherein pixel electrodes electrically connected to the switching elements are disposed on the flattening film; and

wherein in plan view, the pixel electrodes overlap with the source wiring electrodes or the gate wiring electrodes.

2. (Amended) A liquid crystal display according to claim 1, wherein in plan view, the pixel electrodes overlap with the source wiring electrodes and the gate wiring electrodes.

3. (Amended) A liquid crystal display according to claim 1,
wherein the flattening film is composed of a resin layer.

Cancel claim 4 without prejudice or disclaimer.

Amend claims 5 to 9 as follows:

5. (Amended) A liquid crystal display according to claim 1,
wherein the alignment state 1 is a splay alignment state whereas
the alignment state 2 is a bend alignment state.

6. (Amended) A liquid crystal display according to claim 1,
wherein irregularities are provided on the flattening film, and the
level differences of the irregularities are $1\mu\text{m}$ or less.

7. (Amended) A liquid crystal display according to claim 6,
wherein the level differences of the irregularities are $0.5\mu\text{m}$ or
less.

8. (Amended) A liquid crystal display according to claim 1, wherein the spacing between the pixel electrodes is within the range of from 1 μ m to 10 μ m.

9. (Amended) A liquid crystal display according to claim 1, wherein one of the substrates has a plurality of pixel electrodes and the spacing between the pixel electrodes is within the range of from 1 μ m to 5 μ m.

Cancel claims 12 to 32 without prejudice or disclaimer.

Amend claims 33, 34, 39 to 41, 45, 46, and 49 as follows:

33. (Amended) A liquid crystal display which comprises a pair of substrates having electrodes and a liquid crystal layer sandwiched between the pair of substrates,

wherein the liquid crystal layer is oriented in a splay alignment;

wherein alignment films are stacked on the electrodes; and

wherein by making the thickness of the alignment films themselves nonuniform, the surfaces of the alignment layers each have an irregular configuration.

34. (Amended) A liquid crystal display which comprises a pair of substrates having electrodes and a liquid crystal layer sandwiched between the pair of substrates,

wherein the liquid crystal layer is oriented in a splay alignment;

wherein alignment films are stacked on the electrodes; and

wherein by making the thickness of the electrodes nonuniform, the surfaces of the alignment layers each have an irregular configuration.

39. (Amended) A method of manufacturing a liquid crystal display which comprise a pair of substrates including electrodes and a liquid crystal layer sandwiched between the pair of substrates, wherein the liquid crystal layer is oriented in a splay alignment, and wherein the surfaces of alignment layers formed on the surfaces of the electrodes each have an irregular configuration,

the method comprising the step of forming the irregular configurations of the electrode surfaces by use of a UV ash, ozone ash, UV/ozone ash or the like.

40. (Amended) A method of manufacturing a liquid crystal display which has a pair of substrates having electrodes and a liquid crystal layer sandwiched between the pair of substrates;

wherein the liquid crystal layer is oriented in a splay alignment; and

wherein the surfaces of alignment layers formed on the surfaces of the electrodes each have an irregular configuration,

the method comprising:

a dispersion step of dispersing, beforehand, powder or minute particles into printing varnish used for forming the alignment layers on the surfaces of the electrodes; and

an alignment layer formation step of forming the alignment layers by applying the varnish onto the surfaces of the electrodes and baking the varnish.

41. (Amended) A liquid crystal display which comprises a pair of substrates having electrodes and a splay-aligned liquid crystal layer sandwiched between the pair of substrates;

wherein a plurality of spacers are placed between the pair of substrates;

wherein the spacers are securely attached to at least either one of the substrates with an adhesive which increases the pretilt angle of liquid crystal molecules within the liquid crystal layer; and

wherein the adhesive is spread over the substrate.

45. (Amended) A liquid crystal display according to Claim 41, wherein a voltage is applied across the electrodes to cause a transition of the liquid crystal layer from a splay alignment to a bend alignment, thereby performing displaying.

46. (Amended) A method of manufacturing a liquid crystal display which comprises a pair of substrates having electrodes and a splay-aligned liquid crystal layer sandwiched between the pair of substrates,

the method comprising:

a spacer scattering step of scattering spacers onto at least either one of the pair of substrates, the spacers having an adhesive adhered thereto which increases the pretilt angle of liquid crystal molecules within the liquid crystal layer;

a substrate stationary placement step of placing the substrates so as to be stationary, over which the adhesive is allowed to spread; and

a liquid crystal cell formation step of forming a liquid crystal cell by sticking the pair of substrates together.

49. (Amended) A method of manufacturing a liquid crystal display which comprises a pair of substrates having electrodes and a splay-aligned liquid crystal layer sandwiched between the pair of substrates,

the method comprising:

a spacer scattering step of scattering spacers onto at least either one of the pair of substrates, the spacers having an adhesive adhered thereto which increases the pretilt angle of liquid crystal molecules within the liquid crystal layer; and

a substrate stationary placement step of sticking the pair of substrates together on which the adhesive is allowed to spread.

REMARKS

Claims 1 to 3, 5 to 11, and 33 to 49 are presented for examination here. A number of changes have been made in the claims to conform those claims to read as in an allowed Japanese counterpart.

An Information Disclosure Statement and a Petition to Make Special are filed concurrently. The Examiner is requested to review all of these documents when taking the case up for action.

An early examination of claims 1 to 3, 5 to 11, and 33 to 49 is earnestly solicited.

Respectfully submitted,

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December 6, 2001
Date

Attachment:
Mark Up of Amended Claim

CAW/jmz:ame

Attorney Docket No. OGOH:071A

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MARKED VERSION TO SHOW CHANGES MADE

1. (Amended) A liquid crystal display which comprises a pair of substrates and a liquid crystal layer sandwiched between the pair of substrates;

wherein where the alignment state of a liquid crystal when no voltage is applied to the liquid crystal layer is defined as an alignment state 1 and the alignment state of the liquid crystal used for performing displaying is defined as an alignment state 2, the alignment state 1 differs from the alignment state 2; [and]

[wherein the interface between the liquid crystal layer and at least one of the pair of substrates is flattened]

wherein source wiring electrodes, gate wiring electrodes, and switching elements are disposed on one of the substrates;

wherein a flattening film is stacked on the switching elements;

wherein pixel electrodes electrically connected to the switching elements are disposed on the flattening film; and

wherein in plan view, the pixel electrodes overlap with the source wiring electrodes or the gate wiring electrodes.

2. (Amended) A liquid crystal display according to claim 1,
wherein [either of the pair of substrates is an active matrix
substrate] in plan view, the pixel electrodes overlap with the
source wiring electrodes and the gate wiring electrodes.

3. (Amended) A liquid crystal display according to claim 1,
wherein [the interface is flattened by a] the flattening film is
composed of a resin layer.

5. (Amended) A liquid crystal display according to claim 1,
wherein the alignment state 1 is a [spray] splay alignment state
whereas the alignment state 2 is a bend alignment state.

6. (Amended) A liquid crystal display according to claim 1,
wherein irregularities are provided on the flattening film, and the
level differences of the irregularities [on the substrate] are 1 μ m
or less.

7. (Amended) A liquid crystal display according to claim [1]
6, wherein the level differences of the irregularities [on the
substrates] are 0.5 μ m or less.

8. (Amended) A liquid crystal display according to claim [2] 1, wherein [the active matrix substrate has a plurality of pixel electrodes and] the spacing between the pixel electrodes is within the range of from 1 μ m to 10 μ m.

9. (Amended) A liquid crystal display according to claim [2] 1, wherein [the active matrix substrate] one of the substrates has a plurality of pixel electrodes and the spacing between the pixel electrodes is within the range of from 1 μ m to 5 μ m.

33. (Amended) A liquid crystal display which comprises a pair of substrates having electrodes and a liquid crystal layer sandwiched between the pair of substrates,

wherein the liquid crystal layer is oriented in a [spray] splay alignment; [and]

wherein alignment films are stacked on the electrodes; and
wherein by making the thickness of the alignment films
themselves nonuniform, the surfaces of the alignment layers [formed
on the surfaces of the electrodes] each have an irregular
configuration.

34. (Amended) A liquid crystal display [according to Claim 33] which comprises a pair of substrates having electrodes and a liquid crystal layer sandwiched between the pair of substrates, wherein the liquid crystal layer is oriented in a splay alignment;

wherein alignment films are stacked on the electrodes; and wherein [the irregular configuration is a configuration formed by changing the thickness of the alignment layers] by making the thickness of the electrodes nonuniform, the surfaces of the alignment layers each have an irregular configuration.

39. (Amended) A method of manufacturing a liquid crystal display which comprise a pair of substrates including electrodes and a liquid crystal layer sandwiched between the pair of substrates, wherein the liquid crystal layer is oriented in a [spray] splay alignment, and wherein the surfaces of alignment layers formed on the surfaces of the electrodes each have an irregular configuration,

the method comprising the step of forming the irregular configurations of the electrode surfaces by use of a UV asher, ozone asher, UV/ozone asher or the like.

40. (Amended) A method of manufacturing a liquid crystal display which has a pair of substrates having electrodes and a liquid crystal layer sandwiched between the pair of substrates; wherein the liquid crystal layer is oriented in a [spray] splay alignment; and

wherein the surfaces of alignment layers formed on the surfaces of the electrodes each have an irregular configuration, the method comprising:

a dispersion step of dispersing, beforehand, powder or minute particles into printing varnish used for forming the alignment layers on the surfaces of the electrodes; and

an alignment layer formation step of forming the alignment layers by applying the varnish onto the surfaces of the electrodes and baking the varnish.

41. (Amended) A liquid crystal display which comprises a pair of substrates having electrodes and a [spray] splay-aligned liquid crystal layer sandwiched between the pair of substrates;

wherein a plurality of spacers are placed between the pair of substrates;

wherein the spacers are securely attached to at least either one of the substrates with an adhesive which increases the pretilt angle of liquid crystal molecules within the liquid crystal layer; and

wherein the adhesive is spread over the substrate.

45. (Amended) A liquid crystal display according to Claim 41, wherein a voltage is applied across the electrodes to cause a transition of the liquid crystal layer from a [spray] splay alignment to a bend alignment, thereby performing displaying.

46. (Amended) A method of manufacturing a liquid crystal display which comprises a pair of substrates having electrodes and a [spray] splay-aligned liquid crystal layer sandwiched between the pair of substrates,

the method comprising:

a spacer scattering step of scattering spacers onto at least either one of the pair of substrates, the spacers having an adhesive adhered thereto which increases the pretilt angle of liquid crystal molecules within the liquid crystal layer;

a substrate stationary placement step of placing the substrates so as to be stationary, over which the adhesive is allowed to spread; and

a liquid crystal cell formation step of forming a liquid crystal cell by sticking the pair of substrates together.

49. (Amended) A method of manufacturing a liquid crystal display which comprises a pair of substrates having electrodes and a [spray] splay-aligned liquid crystal layer sandwiched between the pair of substrates,

the method comprising:

a spacer scattering step of scattering spacers onto at least either one of the pair of substrates, the spacers having an adhesive adhered thereto which increases the pretilt angle of liquid crystal molecules within the liquid crystal layer; and

a substrate stationary placement step of sticking the pair of substrates together on which the adhesive is allowed to spread.